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FRUIT AND VEGETABLE MARKETING AND PROCESSING IN VIETNAM -- POTENTIAL IMPROVEMENTS

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FOREWORD

This study is one of a series of marketing studies conducted by the U.S. Department of Agriculture in cooperation with the U.S. Agency for International Development and the Ministry of Land Reform, Agriculture, Fishery and Animal Husbandry Development of the Government of South Vietnam.

This marketing series is part of a still larger ERS Vietnam project. The first phase of the larger project was a review of Vietnam's 5-Year Rural Economic Development Plan, with a report published in December 1971. Other phases being completed now are a series of demand and price studies and a linear programming model to study production-distribution relationships for farm commodities.

The purpose of the several series of studies is threefold. The first is to develop a body of economic information from readily available sources for immediate use by the Ministry and USAID Mission in making decisions regarding development of Vietnam's agricultural sector. Secondly, the research methodology used and the economic information developed are to provide a basis for work by the recently-established Directorate of Agricultural Economics. Finally, it is expected that the participation of members of the Ministry staff in the conduct of these studies, together with any specialized training associated with the project, will acquaint them with the research procedures followed so that the analysis can be continued and improved in the future.

The marketing series, of which this report is a part, provides detailed descriptions of marketing systems for several major farm products, supplies marketing input data required for the production-distribution model mentioned above, and assesses the need for changes in the marketing systems. Assessment of the need for change was based primarily upon (1) the relationship of the costs incurred in providing the services required to move farm commodities from farms to consumers and the marketing charge, or margin, for these services; and (2) the extent to which the existing marketing systems provide the services currently required or expected to be demanded in the near future by growers or consumers. Covered in the reports are livestock products, oilseed processing, sugarcane and raw sugar processing, swine, poultry, horticultural crops, grains, and transportation.

Personnel of the Marketing Economics Division of USDA's Economic Research Service had prime responsibility for the studies under Participating Agency Service Agreement No. SA/VN(AJ)103-72. However, many others also deserve recognition for their cooperation and assistance, including other Ministries of the Government of Vietnam; the farmers, merchants, and others in Vietnam's private sector; and the staff of the U.S. AID Mission to Vietnam. Particularly helpful in the fruit and vegetable study were: Shelby Robert, USDA/PASA, adviser with the Office of the Associate Director of Food and Agriculture, USAID; Ike T. Hatchimonji, Office of the ADFA; the Chinese Agricultural Technical Group to Vietnam; Mr. Phuoc and Mr. Chan, Vietnam Agricultural Economic and Statistical Service; and Nguyen Suan Han, Vietnam Ministry of Agriculture.

- William A. Faught
Project Coordinator

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CONCLUSIONS

The fruit and vegetable industry of Vietnam is a very significant part of the total agricultural economy. It is fully capable of providing the present and future domestic needs for these products. As the country develops and becomes more industrialized, consumer tastes and preferences are likely to change. Already it appears that consumption of vegetables other than sweet potatoes and manioc is increasing at the expense of the latter two products. ^{1/} Improvements in quality through improved varieties, cultural practices, and handling by marketing firms, along with lower costs and prices, should enhance the appeal of fruits and vegetables to consumers in the long run and increase the demand.

Prospects for a significant contribution to the economy from fruit and vegetable processing appears remote for the next several years. This applies to both domestic and foreign markets but particularly foreign. The canning plant recently approved for construction will provide further insight into the problems of processing and can-making in Vietnam.

The export potential for bananas and dry onions looks promising. Onions probably can be exported to Hong Kong and Singapore while bananas would go primarily to Japan. Much planning and developmental work will be necessary to establish a successful export program for either of these products.

^{1/} The income elasticities in Vietnam of starchy root crops, fruits (except bananas), and vegetables were estimated by FAO to be 0.3, 0.8, and 0.7, respectively. (Agricultural Commodities--Projections for 1975 and 1985, Vol. 2, Food and Agri. Organization of the United Nations, Rome, 1967, p. 106).

FRUIT AND VEGETABLE MARKETING AND PROCESSING IN VIETNAM-- POTENTIAL IMPROVEMENTS

INTRODUCTION

Fruits and vegetables are produced year-round in much of Vietnam. But considerable movement from the primary surplus producing areas to the population centers and seasonally deficit provinces is necessary. A very well defined and specialized marketing system has developed to accommodate the assembly and distribution of these products. Almost all fruits and vegetables are consumed fresh, with very small quantities preserved.

The purpose for this study was (1) to evaluate the potential for expanding the processing of fruits and vegetables, (2) to recommend ways of improving the fresh marketing of fruits and vegetables, and (3) to evaluate the export potential. It was sponsored by the U.S. Agency for International Development and conducted October 1971 - February 1972.

PRODUCTION

Sweet potatoes and manioc are the major vegetable root crops grown in Vietnam. Production is widely dispersed over most of the country; however, there is some concentration. Manioc production is most important in the northern provinces of the Central Lowlands--Quang Ngai, Binh Dinh, Quang Tin, Quang Nam, and Thua Thien. Except for Thua Thien, sweet potatoes are also grown in greater quantities in these provinces. Other leading sweet potato production areas are the provinces of Kien Giang, An Giang, and Kien Phong in the western part of the Southern Region and the province of Binh Duong.

Excluding sweet potatoes and manioc, about one-third of Vietnam's vegetable production is concentrated around Dalat in the Tuyen Duc province. Other provinces that are important producers of vegetables other than sweet potatoes and manioc include Quang Nam and Thua Thien in the northern end of the Central Lowlands. These two provinces have the second and third largest cities of Vietnam as their capitals--Da Nang and Hue. Also, the provinces of An Giang, Chau Doc, Dinh Tuong, Binh Duong, Hau Nghia, and Tay Ninh are important vegetable producers in the Southern Region. These provinces are generally from southwest to northwest of Saigon. In addition, Ninh Thuan province is the major production area for dry onions and garlic.

Some fruit production is reported in almost all provinces, but not all crops and varieties are distributed that widely. The major fruit production province is Dinh Tuong, which produces over 35 percent of the total output, excluding bananas and pineapple. Phong Dinh, Vinh Long, Sa Dec, and Binh Duong also have relatively large production of fruits. With the exception of

the latter, which is north of Saigon, the provinces are grouped along the Mekong River. The same is true for bananas. Production is primarily in the river provinces of An Giang, Sa Dec, Dinh Tuong, Vinh Long, and Kien Hoa. They collectively account for more than two-thirds of the reported banana production in recent years.

Pineapple production is the most concentrated of the major fruits. The southwestern most province of Kien Giang is reported to produce approximately 60 percent, with Long An producing another 25 percent.

Land area and tonnages for the last 5 years are given in Table 1 for the fruits and vegetables discussed above. In the case of vegetables, the land area and quantities of sweet potatoes and manioc have declined steadily since 1966. On the other hand, other vegetables have shown much greater change, but in the opposite direction. Cabbage, carrots, cauliflower, leafy vegetables, radishes, and onions are the chief items of this grouping in quantity terms. Although the total vegetable supply in 1970 was under the 1966 level, trends indicate that shifts may be taking place in consumers eating habits, with more green and yellow vegetables being consumed.

The supply of fruits has increased in overall tonnage (Table 1). Some decline has occurred in pineapple supplies over the 5-year period of 1966-70. Bananas and other fruits have shown increased output for the last 2 to 3 years. The other fruit category is composed mainly of mango, orange, grapefruit, mangousteen, rambutan, and longan.

CONSUMPTION

The consumption of fresh fruits and vegetables is essentially equivalent to the domestic production since imports are very small (Table 2). Since 1966 the available records show only eight metric tons (MT) of fruit and vegetable exports.

Per capita consumption of fresh vegetables was down three kilograms from 1966 to 1969 and about an equal amount in 1970. Conversely, fruit consumption has increased steadily since 1967, with per capita consumption up a little more than a kilogram in 5 years.

Processed fruits and vegetables are consumed in very limited amounts. Domestically, the production of canned fruits and vegetables has been less than a million cans per year, or roughly 500 MT. Imports in 1968 were 3,804 MT, and 2,800 MT of this were canned fruits. These imports declined to 1,910 MT in 1969 and canned fruit was down to 1,307 MT. For the first 6 months of 1970, imports were on a par with 1969. The November 1971 devaluation of the piaster should restrict this low level of imports even more.

Table 1.--Fruit and vegetable production in Vietnam, 1966-70

Year	Vegetables									
	Sweet potatoes		Manioc		Other		Total			
	Ha.	M.T.	Ha.	M.T.	Ha.	M.T.	Ha.	M.T.	Ha.	M.T.
1966...	39,480	246,150	38,960	280,280	12,000	166,485	90,440	692,915		
1967...	37,800	254,010	36,500	261,885	13,540	192,180	87,840	708,075		
1968...	34,520	234,685	35,130	260,190	13,620	193,055	83,270	687,930		
1969...	34,850	225,560	32,150	233,485	16,885	234,955	83,885	694,000		
1970...	32,860	219,750	30,380	215,710	17,850	217,550	81,090	653,010		
	Fruits									
	Bananas		Pineapple		Other		Total			
	Ha.	M.T.	Ha.	M.T.	Ha.	M.T.	Ha.	M.T.	Ha.	M.T.
1966...	18,120	177,250	5,560	38,790	35,990	201,900	59,670	417,940		
1967...	17,860	167,555	5,750	37,020	33,730	191,165	57,340	395,740		
1968...	17,730	164,065	4,540	34,110	32,340	221,880	54,610	420,055		
1969...	19,210	183,760	4,265	33,255	32,030	222,885	55,505	439,900		
1970...	19,955	203,635	4,475	33,325	32,920	235,705	57,350	472,665		

Source: Agricultural Statistics Yearbooks.

1/ Ha. and M.T. are abbreviations for hectares and metric tons

Table 2.--Fresh fruit and vegetable consumption, 1966-70

Year	All vegetables				All fruits			
	Domestic	Net	Total	Per	Domestic	Net	Total	Per
	: imports	: imports	: : capita	: : capita	: imports	: imports	: : capita	: : capita
	-----metric tons-----				-----metric tons-----			
	Kg.				Kg.			
1966...	692,915	83	692,998	42.0	417,940	993	417,933	25.3
1967...	708,075	13	708,083	41.7	395,740	2,442	398,182	23.3
1968...	687,930	668	688,598	39.5	420,055	5,688	425,743	24.1
1969...	694,000	4,307	698,307	39.2	439,900	7,612	440,512	24.7
1970...	653,010	196 <u>1</u> /	653,206	35.7	472,665	4,880 <u>1</u> /	477,545	26.1

1/ Import-export data for first 6 months.

MARKETING CHANNELS

Most fruits and vegetables move through relatively few marketing firms. This is dependent to a considerable extent upon the distance products move from the producer to the consumer. They may be taken to the nearby market-place where the producer sells directly to the consumer, or the producer may sell to an assembler (dealer) at the farm or some assembly point such as the hamlet. This assembler may in turn transport the product to a central trade area for sale to a wholesaler or sell to a larger assembler (shipper) who will perform the same function of transport to the central market. Wholesalers generally sell to retailers, but in the central market they may sell only to smaller wholesalers.

The Dalat-Tuyen Duc area has already been mentioned as a year-round surplus vegetable production area. About 95 percent of the annual production is shipped to other parts of Vietnam. At least 80 percent of the production goes to Saigon. Marketing channels to accomplish this transfer of products and ownership have become quite well established.

Growers typically trade with a dealer and delivery is made at the farm. Trading may be on a cash basis at the time of harvest or contracted as much as a month before harvest. In some instances the product is shipped on a consignment basis to Saigon, with the dealer acting as a commission agent.

From the dealer the produce goes to one of several shippers in the Dalat area. Transport from the farm to the shipping point is provided by the dealer via a small 4-wheel drive type vehicle if the field is not accessible to large trucks. The shipper's facilities for receiving, storage, and loading are essentially nonexistent. Loading for shipment to the distant markets is usually done on the roadside. Trucks used are primarily of about 10-ton capacity and reportedly haul on the average eight tons of vegetables per load. Loads are likely to be mixed, with a predominance of cabbage.

All vegetable trucks going into Saigon are stopped at the Bien Hoa Highway check point. Arrangements for sale at the Cau Muoi market must be made before the trucks are permitted to pass. This arrangement is usually made prior to arrival at the check point. Trucks cleared to go into Saigon are convoyed to the Cau Muoi wholesale market three times each day. This is done for reasons of security.

Wholesalers have very little storage area and no refrigerated storage. Sales are made to other wholesalers located at the Cau Muoi market as well as those from other wholesale markets in Saigon and provincial towns. Also, retailers from the Saigon area and provincial towns buy at the Cau Muoi market and transport the product to their places of business by all types of conveyance.

PRICES AND MARGINS

Price information is fairly limited. Most of the published price series are for retail. Both retail and wholesale prices are reported for a few of the major items; however, no attempt will be made to summarize these in this report. An analysis of prices with respect to time, form, and space is complicated by inflation and disruptions in commodity flows caused by the war. Prices increase during the rainy season and usually reach a high point in the latter part of the year (October-November) when wet weather factors have combined to reduce available supplies the most. Supplies are greatest during the dry season. Vegetables are particularly abundant in the dry season because many farmers cannot grow rice. As a result prices for most fruits and vegetables are lowest in the February-April period.

The assertion was made by growers and agricultural advisors as well as published reports 2/ that middlemen control the market and reap excessively high profits. Part of this concern undoubtedly stems from the general distrust of middlemen. But the charge may well be justified in the case of primary wholesalers at the Cau Muoi market. Their methods of operation seem to have changed very little since the 1967 study by Bien and others. 3/ In a fairly cursory study of costs and returns, they estimated the wholesalers' mark-up was about 18 percent of purchase price for vegetables when cash costs of handling required less than a 2 percent mark-up. Cash costs were comprised of space rental, parking space for truck unloading, and unloading charges. The balance of the mark-up was reported to be the wholesaler's net profit. However, it is in fact a return to management, family labor, operating capital, containers, and other owned assets. If these items had been charged at their opportunity cost, the actual net profit of the operation would have been determined. Profits would not have been as great but might still be considered excessive.

Apparently the organization of the Cau Muoi market wholesalers has changed very little in the intervening years since 1967. They set prices to be paid for vegetables shipped from Dalat. All vegetables arriving from Dalat in the 10-ton trucks must be sold to these wholesalers. About 90 percent of the vegetables delivered from there are estimated to be hauled by these large trucks. 4/ This does place these middlemen in an unduly strong bargaining position with respect to Dalat vegetable shippers and warrants questioning the legitimacy of their marketing charges.

2/ See, for example, Hoang Thi Kim Bien, et al., "A Report on the Marketing of Vegetable Crops," Working Paper No. 1, Joint Development Group, Saigon, August 1967, pp. 8-20.

3/ Ibid., pp. 10-12.

4/ Daniel Chen and K.C. Kuo, "Survey Report on Vegetable Production and Marketing in the Area of Dalat," Mimeograph report, Chinese Agricultural Technical Group to Vietnam, 1971.

PROCESSING

Current State of the Industry

The volume of fruit and vegetable processing is very small in Vietnam. The canning is carried on in fish canning plants and there is no freezing of these products. Five fish canneries report some processing of other products, primarily tomato sauce, pineapple, longan, and dried green Alaska peas. All five of these plants are located in Saigon. Construction of a new plant has been authorized in the Bien Hoa Industrial Park.

Tomato sauce is used mainly as an ingredient for some of the fish products. The tomatoes are processed into sauce and placed in institutional size containers until used in fish canning.

Total output of canned fish in 1970 was approximately 3.3 million cans. Fruits and vegetables accounted for about 1.2 million cans of additional production for the cannery. On a 24 can per case basis, the latter amounts to only 50,000 cases. This is considered to be a fairly small output for even one line in a multiproduct plant.

The quality of finished product is low because of the inferior can manufacturing process and raw product quality. Can manufacturing is a major part of each canning plant. Sheet metal for the cans is imported. Can making equipment is semiautomatic but requires handling of individual cans many times. Hand soldering of can seams presents one of the greatest technical problems in that use of too much tin in soldering causes the inner wall to be contaminated by sulphuric acid and corrode. These technical problems of canning appear to have changed very little since the 1965 study of food processing by Shiu Lee, a food processing specialist from Taiwan. ^{5/} Quality problems with cans could be alleviated with new automated equipment. Profitable investment in this type equipment would necessitate larger canning plants or use of the cans by several canning plants because of the greater manufacturing capacity of the automated can manufacturing equipment.

Can manufacturing equipment used for rectangular sardine cans is not compatible with round can-making equipment requirements; therefore, essentially, separate lines are required for each. About the smallest can-making line considered economical would have an output of 200 cans per minute and a minimum annual output of 20 million cans.

Authorization was given recently for the construction of a new canning plant in the Bien Hoa Industrial Park. Like present canneries, it is primarily for sardines, with annual capacity up to 10 million cans plus capacity

^{5/} Shiu Lee, "Survey Report on Development of Food Processing Industry in Vietnam," unpublished special report to the Ministry of Economic Affairs, May 1965.

for up to 5 million cans of fruits and vegetables (pineapples, tomatoes, and green peas). This plant is reportedly installing automatic can-making equipment with an annual output capability of 20 million cans.

Even with an improved can the raw product quality problem is still formidable. Except for the imported dry Alaska peas, the raw product currently used for canning is the same as that sold for fresh consumption. In fact, it is essentially purchased out of fresh product marketing channels. Experience in other countries has shown that varieties grown for fresh market production are not usually the best processing varieties. Also, greater control needs to be exercised over cultural practices and maturity at harvest than is normally exercised in fresh market production. Quality control is as essential as efficiency to the development of a viable canned food industry.

Potential for Fruit and Vegetable Processing

The potential for Vietnam to make any major expansion in the fruit and vegetable processing industry is very doubtful at the present time. Quality of fruits and vegetables available is in general high enough for processing. Currently grown varieties of these products do not appear to be well adapted to meeting the rigorous quality requirements for processing.

Domestic demand for processed fruit and vegetables does not appear to have a very great potential at this time. The availability of a good selection of fresh fruits and vegetables over the entire year at reasonable prices restricts the domestic demand for the processed forms.

Plants must have greater output capacity in order to achieve economies associated with size and hence a more competitive cost structure. This is true particularly if the export market is to be entered.

EXPORT OPPORTUNITIES

In the export market two products offer the greatest opportunity at the present time. They are dry onions and bananas. This is not to say that other fruits and vegetables will not be exported, but these two products offer more potential for immediate development.

Onions as well as garlic are grown in Ninh Thuan province. They are grown on the sandy type soils along the coast and irrigated from subsurface water pumped from hand-dug wells. Although only slightly more than 500 hectares of land are currently producing onions and garlic, there may be as much as 15,000 hectares of suitable soils that could be brought into cultivation if irrigation water were available. Only about 230 hectares of onions were produced in 1970, with a yield of almost 2,300 metric tons. Varieties grown currently are not well suited for storage, even if Vietnam had drying facilities

and refrigerated warehouses for a few months of storage. Better varieties and improved cultural practices could increase production substantially on present land area.

Prices of onions are generally lowest at Phan Rang in March and April when harvest is at its peak. During this time and for a few months thereafter, prices are at relatively low levels. In 1970, average monthly prices in VN\$ per kilogram for large onions at Phan Rang from February through August were 150, 35, 30, 40, 55, 70, and 80 respectively.

Some price-quantity data for Hong Kong onion imports for 1970 have been summarized by Robert. ^{6/} Excluding imports from mainland China, which accounted for two-thirds, all other countries supplied 77,617 hundredweight at HK\$35. This is equivalent to 353 metric tons at VN\$54 per kilogram. (Exchange rates used were VN\$410 to HK\$5.80 to US\$1.)

Transportation costs to Saigon are about VN\$3.50 per kilogram. Assuming bagging, handling, spoilage, shrinkage, loading, and marketing charges account for VN\$11.50 and the price to the grower is VN\$30 per kilogram, the price of onions f.o.b. ship at Saigon would be roughly VN\$45 per kilogram. (If shipment could be made from Cam Ranh, this could be reduced slightly.)

The price differential between Saigon and Hong Kong is VN\$9 per kilogram or US\$22 per metric ton, which is substantially more than the expected ocean freight. Further checks may determine that prices in Hong Kong and perhaps at other nearby points such as Singapore are relatively high at the time Vietnam's are at their lowest. Also, any reduction in production costs will help strengthen Vietnam's position in the export market.

Bananas were exported prior to 1968. A level of almost 650 metric tons was reached in 1964. Shipments in 1959 and 1969 were to Hong Kong but, following that, and after clearing up questions about diseases and insects, exports were also made to Japan. Information obtained through the American Agricultural Attache in Japan implied that the fruit from Vietnam had higher moisture content than the Japanese prefer.

Japan imported 843,891 metric tons of bananas (including plantains) in 1970 (Table 3). ^{7/} More than two-thirds of these were shipped from Central America. For 1971, the overall import volume was up almost 20 percent to one million metric tons, with most of the increase provided by Taiwan and the Philippines. All imported bananas are in a standard 16 kilogram carton. Japanese banana requirements should continue to increase because of its income and population growth.

^{6/} Shelby Robert, J., USDA/PASA marketing adviser with Office of Food and Agriculture, USAID/Saigon.

^{7/} A 1967 study by FAO estimated the income elasticity for bananas in the eastern part of Southeast Asia to be 0.92 in 1966 (op.cit., p. 226).

Table 3.--Source, quantity, and price of bananas imported by Japan, 1970-71

Source	Quantity in : 1970	1970 Price (c.i.f.) 1/ MT.	Quantity in : 1971 based on 10 month	1971 Price (c.i.f.) for first 10 months
	MT.	¥/MT.	MT.	¥/MT.
Asia:				
C. China.....	276	42,402	--	--
Taiwan.....	213,692	61,221	356,460	51,124
Hong Kong.....	45	60,714	--	--
Philippines.....	54,754	53,001	163,954	44,920
Central America:				
Guatemala.....	7,624	67,784	--	--
Honduras.....	6,626	67,710	--	--
Costa Rica.....	91,198	62,825	73,828	56,169
Panama.....	1,088	63,618	11,165	57,420
Ecuador.....	468,584	62,151	402,091	51,205
Other.....	4	49,441	--	--
Total or average:	843,891	61,485	1,007,497	50,586
				57,668

1/ Conversion rate was 360 yen (¥) = VN\$410 = US\$1; c.i.f. is cost, insurance, and freight.

Source: Japanese statistical reports.

Prices (c.i.f. Japan) were higher each year for Central America bananas than for those from Asia (Table 3). Information was not available as to the cause for this. There may be factors other than quality which contribute to the price difference. Other possible causes are type or variety of bananas, size, seasonal supplies, or availability of alternative markets.

The larger volume of bananas imported by Japan in 1971 was at a reduction in price of approximately 18 percent. For the first 10 months of 1971 the average price (c.i.f. Japan) was VN\$57.67 per kilogram as compared to VN\$70.09 in 1970 (Table 3).

If the 1970-71 average c.i.f. price of VN\$64 is taken as the base, and a freight, insurance, and loading charge of VN\$9 per kilogram is deducted, a Vietnam shipping point price of VN\$55 is derived. Deductions for costs of handling, cartons, transportation, and other marketing charges must be made to derive the grower price of VN\$35.

In spite of the problems with high moisture as reported by one Japanese importer, available evidence strongly suggests that Vietnam can profitably produce good quality bananas for export. The Gia Cui variety of banana which is grown for export by Taiwan is grown in Vietnam and is considered to be well adapted. 8/ Taiwan and the Philippines are frequent victims of storms which cause considerable damage to banana plants. The Delta of Vietnam has a history of being relatively free from typhoons, which gives some weather advantage over the two competitors.

Export of processed fruits and vegetables offers little prospect in the near future for Vietnam's fruit and vegetable industry. Many of the reasons have already been enumerated but a few others are worthy of mention. Competition in the export canned food market is very strong. Generally no shortages of major products exist. The high cost structure of Vietnam's canning industry due to can costs and scale of operation places it in a poor position to compete at this time.

PROBLEM AREAS

Technical

A number of technical problems associated with the production and marketing of fruits and vegetables are worthy of mention. Undoubtedly much work needs to be done to develop new and improved varieties for many of the crops. On the other hand, there is ample opportunity to do a far better job with the current varieties than is now being done. Reports were widespread regarding

8/ "Five-Year Rural Economic Development Plan, 1971-1975, Agriculture Development Program, Banana Project," Ministry of Land Reform, Agriculture, and Fishery Development, Saigon, 1970.

the need for better cultural practices with respect to types and amounts of fertilizers and pesticides used. Availability of the latter is also a factor.

Production of bananas for a successful export program requires a high level of management, coordination, and planning. Currently the bulk of the production is in small gardens, around the houses, and around the edge of crop land. Quality under such conditions has been less than adequate for export. Production of bananas in most major export countries is under plantation conditions where a high degree of control can be exercised. The question arises as to the ability of Vietnam to initiate an export program without some type of plantation production scheme for bananas.

Harvesting is a very critical area of concern. Two problems stand out--maturity and post harvest field handling. Products are often harvested immature or overmature. For example, in October and November of 1971, onions were being harvested before they were sufficiently matured and carrots were too mature. After harvest produce was left in the fields without adequate protection for quality maintenance. The result was sun scald and wilting.

Excessive handling of the individual pieces of fruits and vegetables often takes place. This not only damages the product but also increases labor requirements and the cost of marketing. Facilities for grading, packing, temporary storage, and loading are completely lacking even in the major vegetable production area of Dalat.

Losses taking place in transit are excessive. These losses stem from three sources: (1) improper loading, (2) no refrigeration, and (3) unduly long delays in transit. The solution to the latter problem would go a long way toward reducing losses caused by the other two. Loads of vegetables hauled from Dalat to Saigon require more than 24 hours for delivery over the 300 kilometer distance when 5 to 6 hours should be sufficient for the trip. The problem of loading improperly is primarily associated with containers. Products such as cabbage, cauliflower, and chayote are racked individually on the truck. This not only causes great weight to be exerted on the bottom of the load but also prevents air circulation and heat removal. None of the trucks are refrigerated, but, unless loading arrangements are changed to permit the air to circulate freely, the value of refrigeration would be seriously limited.

Short term storage facilities are very inadequate. Facility problems at Dalat have already been mentioned. At the big Cau Muoi wholesale market storage is very limited, and there is no refrigerated storage for even the highly perishable items.

Long term storage for perishables is very limited. The need for more long term storage space is uncertain until the economic and technical feasibility of dry onion and garlic storage is analyzed. Onions and garlic must be cured adequately before going into the marketing channels. This may be

done in the field, on drying floors, in open sheds, or by artificial means. The neck and outer scales must be completely dry before the onion is considered cured. Mature onions lose 3 to 5 percent of their weight in curing. 9/

In tropical climates onions and garlic must be stored under refrigerated conditions at 0°C. This will keep them dormant and reasonably free from decay if they are sound and well cured when stored. Globe onions and garlic can be kept 6 to 8 months in refrigerated storage, but the mild or Bermuda types have poor keeping qualities. The latter are usually consumed shortly after harvest in the United States but may be kept in refrigerated storage for 1 to 2 months at 0°C. 10/

Marketing

Market information is very limited from the standpoint of the grower's need. No public information is available with respect to current and future supply conditions. The grower is disadvantaged in his bargaining with the buyer because price information that is available by word of mouth and other private means to the buyers on a daily basis is not generally available to growers.

The problem of market information is further complicated by the lack of a set of grade standards on which to base price quotations. Something more is needed than terms such as small, medium, and good and bad to meaningfully describe the current market conditions for a given product. The terms must be fairly precisely defined and understood by all trading parties.

Buyer collusion can work to the disadvantage of both producers and consumers. In situations where excessive profits are being made by middlemen, as alleged in the case of the Cau Muoi wholesalers, prices paid growers are depressed somewhat and this tends to restrict production of vegetables. Consumers have less total available product at a higher price. The producer and consumer sustain losses under the arrangement.

A dearth of information exists regarding consumer behavior. Little is known about their preferences. Is there a need for improved quality and a willingness to pay the additional costs that may be incurred? Is there a significant need for change in product form or multiple forms such as fresh and processed? These are some of the questions that are unanswered at present.

9/ United States Department of Agriculture, "The Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks," Agricultural Handbook No. 66, U.S. Department of Agriculture, Oct. 1968, U.S. Government Printing Office, Washington, D.C. pp. 44-46.

10/ Ibid.

RECOMMENDATIONS

A great many things can always be pointed out as needing improvement in any production and marketing system. Recommendations made here are those deemed to be among the most important. No attempt is made to order them inasmuch as they should not and cannot be approached in that manner, but should be attacked on several fronts simultaneously. The recommendations begin with producer problems and are as follows:

1. Accelerated efforts are needed in the testing of varieties, fertilizer and pesticide applications, and other cultural practices. This program should be oriented not only to improving yields and cost of production but also to better quality of product.
2. An educational program to better appraise growers and dealers of improved growing and harvesting practices should be encouraged. The latter must give emphasis to maturity and techniques as they relate to maintenance of quality and market requirements.
3. A program to better maintain the quality of product and minimize product losses in marketing channels should be given relatively high priority. Losses from spoilage of some vegetables from Dalat frequently run as high as 25 to 40 percent upon arrival in Saigon. Recommended approaches to this problem are:
 - a. Establish market facilities in Dalat for assembly, grading, packing, and shipping. Space should be provided for the simultaneous unloading and loading of product by each assigned dealer or shipper. Additional area would be required for grading (or sizing), packing, weighing, empty container storage, and temporary product storage. Flexibility in the size of a dealer's assigned area should be permitted in order to accommodate the different sizes of firms. No provision would be made for cold storage facilities at the shipping point until its value can be demonstrated. Although the number of dealers that would utilize these facilities was not determined, it is estimated that about 75 square meters of space will be required for each dealer. Cost of this simple type facility with raised concrete floor is estimated at VN\$25,000 per square meter, not including land costs. The facility could be financed with government funds and leased to marketing firms; however, the certainty of its use would need to be assured prior to construction. If use of shipping containers becomes widespread, the need for this type facility should be greater. Grading, sizing, and load arrangement will be contributing factors to its use also.
 - b. Use of shipping containers to help reduce spoilage and damage to vegetables in transit and labor for handling should be implemented. These containers may be some type of reusable bag for

the more durable products, bamboo baskets of the type currently used for product assembly and transport of some leaf type crops, or a slat type wooden box or crate. The latter might be feasible to construct from locally produced, low quality lumber and salvaged at the final delivery point.

- c. Refrigerated trucks may prove feasible eventually, but in the interim, use of ice should be studied for those products that are not damaged in transit by ice and water. The high temperature buildup can be alleviated in this manner. Refrigerated transportation requirements would be considerably less if fewer mixed loads were hauled. Lettuce and cauliflower, for example, need refrigeration, but cabbage is not so perishable. Potatoes do not need refrigeration in transit. With an assembly point marketing facility, fewer mixed loads would be necessary. This is particularly true for trucks going to Saigon since even the mixed loads go to the Cau Muoi market.
 - d. Alternative security controls that will help minimize transit time for perishable products should be implemented. Delays at the Bien Hoa check point are for several hours on many occasions. Spoilage losses from the additional delay may be greater than the cost of a more flexible arrangement. Moreover, the arrangement helps maintain the imperfections in pricing at the Cau Muoi market.
4. An expert in market quality, transportation, and facilities should be trained to work with the fruit and vegetable industry. Some of the problems of product and quality losses may be partially alleviated through demonstrations and technical innovations by this expert.
 5. The proposed market news system should be started without further delay. A first step should be to provide growers in the Dalat area with Saigon and Da Nang market information. The program could be expanded from time to time as needed and as more funds and expertise become available.
 6. Grades and standards are important to the market news program. Simple grades and standards should be developed based on market quality differences that are reflected by significant price differentials. Grades and standards from nearby countries may be of considerable assistance in their development.
 7. Further study of fruit and vegetable wholesaling in Saigon is needed. The Cau Muoi wholesale market should be analyzed to determine more specifically its structure and performance. Effects of any inequities found therein upon the other market participants could then be brought into focus. This study also should include an evaluation of the adequacy of current wholesale facilities.

8. Further analysis of the export potential for dry onions must be made. If these results are favorable, a fully integrated program should be implemented to insure growth of best varieties, good cultural practices, proper curing and storage facilities, and arrangements for export delivery.
9. A plan should be developed for exploiting the Japanese import market for bananas. This cannot be done without a coordinated effort from production through delivery to a Japanese importing firm. Production will need to be on a year-round basis. Harvest is required at least once each week to prevent overripening of fruit. Shipment should be made as soon as possible after assembly, stem removal, and packing. During shipment and any temporary storage, the pulp temperature of the fruit must be kept at 56° to 58°F. and a relative humidity of 90 to 95 percent to minimize ripening. 11/

Bananas are usually shipped on special ships that are designed to handle their unique requirements. Ships now in service have a capacity of 1,000 to 2,500 metric tons or more. The production of almost 3,000 hectares of bananas with an assumed yield of 20 metric tons each (including stems) would be the minimum size production unit needed to ship 1,000 metric tons per week. However, the production requirements would depend in part on the size of the ships and the length of time required for a round trip.

In order to accomplish the needed production of bananas for export, a plantation type arrangement is recommended. Land ownership could be by one or many farm firms as long as production requirements can be maintained. The overall coordination of production must be under control of a single firm. Experience has shown that fertilizer and spray programs for bananas should be carefully carried out if quality is to be controlled. Practices such as cultivation and harvesting may be carried out by the farmer.

Provision must be made for the assembly of fruit on equipment designed to prevent bruising while enroute to the packinghouse. At the packinghouse the fruit must be cut from the stem, washed, weighed, and packed into shipping containers. If port facilities are distant from the packinghouse, some means of transporting the filled containers will be required.

The total capital and organizational requirements for this endeavor were not determined; however, they would be substantial. In the initial phase of developing this industry, it is recommended that the GVN negotiate a contract with a foreign investor having the necessary resources to accomplish the development of a sound production and marketing program. A Japanese investor is preferred since the primary market is Japan.

11/ United States Department of Agriculture, op. cit., p. 26.

